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AN ANALYSIS OF BASIC WORK-STUDY SKILLS
IN GRADES SIX, SEVEN, AND EIGHT

Submitted by
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(B.S. of Ed. 1924 Brown U. C.)

In Partial Fulfillment of Requirements for the
Degree of Master of Education

May 1944

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ACKNOWLEDGMENTS

In making acknowledgments the writer hesitates to speak particularly of the assistance of individuals because there are so many who should be included. Albeit, justice requires it for this writer was very doubtful of the course to pursue in composing such a paper and needed encouragement and help to persist in the work after it was started. For the inspiration to begin and the encouragement to finish the task, I am deeply indebted to Dr. W. Linwood Chase who was my advisor. His wise counsel will serve me well long after this work has gathered dust. His classes and conferences have given me a wealth of delightful memories. To Thecla, Julia, and Gertrude I owe especial acknowledgment for their help and enthusiasm in instances connected directly and indirectly with the writing of this thesis. I also wish to express my appreciation to the administrators and teachers who made it possible for me to obtain the data used in this study.

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CHAPTER I

INTRODUCTION

This study is an attempt to ascertain how far the pupils in the public schools of Town X, Massachusetts, have progressed in their development of the basic work-study skills as revealed by tests in (1) map reading, (2) the use of an index, and (3) the reading of graphs, charts, and tables. Since the value of testing lies in the use made of the test results, it is hoped that this study will be of use to the teachers and administrators of that school system.

The town in which this study was made is an ordinary New England town and is typical of the large towns in central Massachusetts. Its population of 17,000 is predominately the second and third generations of French Canadians, Italians, and Poles, and the fourth and fifth generations of the early English and Irish settlers. It has a diversity of industries which require highly skilled workers as well as semi-skilled and unskilled workers.

The school population which numbers just over 3,000 is provided for in ten schools, seven of which are public schools and three of which are parochial schools. Of the seven which constitute the public school system, four are grammar schools each having grades one through eight, one is an elementary school which has grades one and two and the classes for the mentally deficient children, one is a four year high school, and the last is a trade school for boys.

As happens in so many towns, in past years money and effort have been expended upon testing programs which have stopped with simply measuring achievement in relation to the norms given by the authors of the selected tests. After the scores have been examined, the test results have been forgotten and no further reference has been made to them. In other words, their constructive possibilities have been neglected. The values of any Educational testing program lies in the extent to which the results "contribute to the improvement of classroom teaching, to more effective supervisory practices, and to the better educational guidance of the pupils"1/ With this in mind an effort has been made to determine those specific work-study skills most greatly in need of attention. As a result of locating those weaknesses, the findings may prove of value in identifying the areas which need increased emphasis.

The tests used in this study are "directly concerned with certain basic skills and abilities and are not intended to measure total achievement in any subject in any given grade. These skills are all crucial in the whole educational development of the pupils, and largely determine the extent to which he can profit by later instruction."2/ Therefore the results should be helpful in locating instances of serious neglect, and it is not unreasonable to hope that eventually more definite

1/ Manual For Interpretation of Iowa Every-Pupil Test of Basic Skills, Form L, page 21.

2/ ibid; pages 1 and 28.

and adequate provision will be made for the development of these skills by systematic instruction.

The Iowa Every-Pupil Test of Basic Skills, Form L, Test B, Advanced Battery 1/ was used for the study. This test was chosen because the norms for the test are based on the results of tests given to a school population comparable to the school population in Town X. Since the primary objective is to determine the progress made by the pupils in specific skills, the comparison with the established norms is of secondary importance. Norms are necessary, however, as a basis for measuring the progress made from year to year.

To get the data for this study the test was given to a total of three hundred fifty children in the sixth, seventh, and eighth grades of the four grammar schools. Because no test was given to the 31 absentees, this is not the total enrollment of those schools. The distribution is as follows: sixth grade, one hundred ten; seventh grade, one hundred thirty; and eighth grade, one hundred ten. The tests were given in a period of two weeks in the latter half of December, 1943. The writer administered and corrected all the tests. After the tests had been scored, the results for each grade were recorded on the record sheets furnished with the tests. (These results, for each pupils and each grade, are available to the teachers.)

1/ Published by Houghton Mifflin Company, Boston, Mass.

At this point three tests in the battery were chosen for the detailed analysis of skills for this particular study. The tests chosen were Part I: Map Reading, Part 3: The Use of an Index, and Part 5: Reading Graphs, Charts, and Tables. Part 2: The Use of References, and Part 4: The Use of the Dictionary were not used for detailed analysis. Each of these tests chosen was then analyzed for the specific skills involved and for the extent to which each of the skills had been mastered.

Following this analysis, remedial suggestions were found. These suggestions can be used to facilitate the development of the skills in which the children have revealed their weaknesses.

In chapter two the detailed analysis of the tests is given together with the suggested remedial measures. In some instances the need for curriculum reorganization may be indicated, but no attempt has been made to suggest how this reorganization may be effected.

CHAPTER II

THE DETAILED ANALYSIS OF THE TESTS

Table I, is a composite of class medians and grade equivalents for all grades tested in all schools on the three selected tests. The established norms are given here for the purpose of comparison.

STANDARD NORMS

	Test 1		Test 3		Test 5	
	Score	Grade Equiv.	Score	Grade Equiv.	Score	Grade Equiv.
Grade VI	12	6-4	8	6-4	9	6-4
Grade VII	14	7-4	10	7-4	12	7-4
Grade VIII	16	8-4	13	8-4	14	8-4

TABLE I

	Test 1 Map Reading		Test 3 Use of the Index		Test 5 Reading Charts Graphs & Table	
	Class Median	Grade Equiv.	Class Median	Grade Equiv.	Class Median	Grade Equiv.
W. Grade 6	9.5	5-2	6.5	5-0	6.0	4-8
W. Grade 7	11.5	6-1	8.5	6-3	8.0	5-9
W. Grade 8	11.0	5-8	10.0	7-1	8.0	5-9
E. Grade 6	12.0	6-3	8.0	5-9	8.0	5-9
E. Grade 7	15.0	8-0	11.0	7-6	10.0	6-7
E. Grade 8	15.0	8-0	12.0	7-9	13.0	7-9
M. Grade 6	10.0	5-3	6.0	4-8	6.0	4-8
M. Grade 7	11.0	5-8	9.0	6-6	8.0	5-9
M. Grade 8	16.0	8-7	12.0	7-9	13.0	7-9
C. Grade 6	9.5	5-2	7.0	5-2	7.5	5-6
C. Grade 7	12.0	6-3	10.0	7-1	9.0	6-4
C. Grade 8	11.0	5-8	13.0	8-4	12.0	7-6
All Grade 6	9.5	5-2	6.5	5-0	7.0	5-4
All Grade 7	11.5	6-1	9.5	6-9	8.5	6-2
All Grade 8	13.0	6-9	12.0	7-9	12.5	7-7

From the summary three things are apparent: first, that the schools are consistently a year or more below the established norms for the test; second, that a certain amount of progress has been made each year; third, that in only three instances has a full year's growth been made.

In a study of the individual schools we can see the following facts. On test 1 at school "W" the pupils in grade eight scored only six months higher than the sixth grade pupils in the same school and showed a loss when compared with the seventh grade score in that school. On test 3 the seventh grade made a gain of a year and three months whereas the eighth grade fell two months short of a year's growth. On test 5 no growth was shown at all between the seventh and eighth grades.

On test 1 at school "E" rapid growth was shown between the sixth and seventh grades but none at all between the seventh and eighth grades. On test 3 rapid growth is also shown between grades six and seven but only a slight growth between seven and eight. Test 5 shows consistent growth throughout the three grades.

At school "M" apparently very little progress is made in map reading (test 1) in the sixth and seventh grades but remarkable growth can be noted in the eighth grade. On tests 3 and 5 the sixth grade scored lower than the other schools. However, more than a year of growth is shown for each of the other grades.

At school "C" the results on test 1 are similar to the results shown at the school "W", i.e., a loss between the

seventh and eighth grades and only a slight growth over the sixth grade score. It is surprising to find on test 5 a higher score than on test 1. This is not shown in any other school.

It is evident from test 1 that very little map reading is done in the first half of the sixth grade or in the grades below the sixth. In three schools the emphasis on maps seems to be in the seventh grade, and in one school the emphasis seems to be concentrated in the eighth grade. On test 3 school "C" came nearer to the expected score than any of the other schools. It must be remembered that on all the tests all schools are below the standard norms.

Map Reading Test 1.

Since maps employ definite symbols and conventions which form a language, they are a tool by which the reader can get a vast amount of factual information. Map reading involves a group of specific skills which are measurable. Test 1 of this group of tests measure the following skills:

1. Ability to read direction.
2. Ability to read direction of land slope from the direction of river flow.
3. Ability to recognize symbols.
4. Ability to use a scale of miles.
5. Ability to interpret symbols by the use of a key.
6. Ability to give latitude and longitude of a certain place.
7. Ability to find direction by the use of a parallel.
8. Ability to recognize the general pattern of a time zone.
9. Ability to estimate man's way of living in a region from the location of that region in the world sun pattern.

10. Ability to apply physical facts to a map situation.
11. Ability to read facts directly from a single pattern map.
12. Ability to read facts directly from two pattern maps.
13. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.^{3/}

The number of correct scores on each question of each skill for each class was tabulated and the percentage of mastery by the class was found. The skills were then listed for each class in the order of mastery from best to least. Tables II through XVII show the results of this analysis.

Tables III, IV, and V contain the detailed study of this test for school "W". The order of mastery of the skills in grades six, seven, and eight of this school are as follows:
Grade 6.

1. Ability to read direction.
2. Ability to read facts directly from a single pattern map.
3. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
4. Ability to read facts directly from two pattern maps.
5. Ability to recognize the general pattern of a time zone.
6. Ability to use a scale of miles.
7. Ability to recognize symbols.
8. Ability to apply physical facts to a map situation.
9. Ability to interpret symbols by the use of a key.
10. Ability to obtain facts from several pattern maps and use

^{3/} Manual For Interpretation, op.cit., p. 42-47

TABLE III
TEST 1 READING MAPS GRADE 5 " " SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		PERCENT CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	9		
	2	15	24	30
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	1		3.33
3. ABILITY TO RECOGNIZE SYMBOLS.	6	10		
	7	8		
	10	1	36	24
	17	7		
	18	7		
4. ABILITY TO USE A SCALE OF MILES.	11	2		
	12	13	10	25
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	10		
	16	7	19	21.11
	20	2		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	1		3.33
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	5		
	9	4	7	11.07
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	15		
	10	3	19	31.07
9. ABILITY TO ESTIMATE PHYSIC WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	11		30.07
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	14		
	10	7	21	23.33
	20	2		
11. ABILITY TO READ FACTS DIRECTLY	21	10		
	23	13		
	28	12	50	37.20
	30	7		
	33	4		
12. ABILITY TO READ FACTS INDIRECTLY FROM TWO PATTERN MAPS.	22	9		
	29	12		
	31	14	40	33.33
	35	5		
13. ABILITY TO JUDGE FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MANY PROBABLY LIVE IN THE REGION.	24	1		
	25	0		
	26	0		
	27	10	48	20
	32	7		
	34	5		
	36	2		
	37	4		

them in estimating how man probably lives in a region.

11. Ability to find direction by the use of a parallel.

12.5 Ability to give latitude and longitude of a certain place.

12.5 Ability to read direction of land slope from the direction of river flow.

Grade 7.

1. Ability to read facts directly from a single pattern map.

2. Ability to read facts directly from two pattern maps.

3. Ability to read direction.

4. Ability to interpret symbols by the use of a key.

5. Ability to recognize symbols.

6. Ability to apply physical facts to a map situation.

7. Ability to recognize the general pattern of a time zone.

8. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.

9. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.

10.5 Ability to use a scale of miles.

10.5 Ability to find direction by the use of a parallel.

12. Ability to give latitude and longitude of a certain place.

13. Ability to read direction of land slope from the direction of river flow.

Grade 8.

1. Ability to read facts directly from a single pattern map.

TABLE III
TEST 1 READING MAPS GRADE 7 "L" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	0		
	2	17	17	36.11
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	2	5.56
3. ABILITY TO RECOGNIZE SYMBOLS.	6	14		
	8	6		
	10	6	52	22.22
	17	12		
	1	11		
4. ABILITY TO USE A SCALE OF MILES.	11	3		
	12	10	13	15.00
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	20		
	19	13	37	34.26
	20	4		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	4	4	11.11
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	5		
	9	8	13	12.00
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	14		
	10	5	19	21.39
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	7	7	19.44
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	12		
	10	13		
	20	4	29	20.00
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	30		
	23	10		
	26	18	41	45.00
	30	5		
	35	12		
12. ABILITY TO READ FACTS DIRECTLY	22	10		
	29	10		
	31	25	54	37.50
	35	3		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	2		
	25	11		
	26	19		
	27	12	37	23.70
	32	12		
	34	3		
	36	2		
	37	0		

TABLE 17

TEST 1 READING MAPS GRADE 8 "A" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		PERCENT CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	11	30	33.46
	2	10		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	2	5.13
3. ABILITY TO RECOGNIZE SYMBOLS.	6	11	46	23.39
	9	3		
	16	5		
	17	10		
	18	15		
4. ABILITY TO USE A SCALE OF MILES.	11	4	21	26.92
	12	17		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	21	57	43.72
	19	20		
	20	10		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	5	5	12.62
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	3	8	10.26
	9	5		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	19	21	26.92
	10	2		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	15	15	30.46
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	14	50	42.74
	19	26		
	20	10		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	33	103	52.62
	23	21		
	28	21		
	30	17		
	33	11		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	17	50	37.16
	29	11		
	31	25		
	35	5		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	2	57	23.26
	25	11		
	26	19		
	27	12		
	32	12		
	34	3		
	36	2		
	37	6		

2. Ability to interpret symbols by the use of a key.
3. Ability to apply physical facts to a map situation.
- 4.5 Ability to estimate man's way of living in a region from the location of that region in the world sun pattern.
- 4.5 Ability to read direction.
6. Ability to read facts directly from two pattern maps.
- 7.5 Ability to recognize the general pattern of a time zone.
- 7.5 Ability to use a scale of miles.
9. Ability to recognize symbols.
10. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
11. Ability to give latitude and longitude of a certain place.
12. Ability to find direction by the use of a parallel.
13. Ability to read the direction of land slope from the direction of river flow.

Table V gives a summary of the distribution of the position of mastery of these skills. By using tables II, III, IV, and V with the list of skills in the order of their mastery, it can readily be seen that there is no consistency in the order of progress made from year to year on the various skills. For example, Skill 1 - ability to read direction - ranked first in the sixth grade, eleventh in the seventh grade, and eleventh in the eighth grade. From table II we see skill 1 in grade six received a correct score by 40% of the pupils. The same skill in grade seven had a percentage of 36.11 (table III) and in grade eight (table IV) a percentage of 38.46. The eighth grade

percentage of mastery shows a gain over the seventh grade and a loss from the sixth grade. Skill 3 shows another unexpected change of position.

TABLE V

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY OF
SKILLS FROM BEST TO LEAST-----SCHOOL "W"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8	Skill 9	Skill 10	Skill 11	Skill 12	Skill 13
Grade 6	1	12.5	7	6	9	12.5	11	5	3	8	2	4	10
Grade 7	3	13	5	10.5	4	12	10.5	7	9	6	1	2	8
Grade 8	4.5	13	9	7.5	2	11	12	7.5	4.5	3	1	6	10

The percentage of mastery for skill 3 in grade six was 24, in grade seven it was 28.89, and in grade eight it was 23.59. The eighth grade achievement is lower than either the sixth or seventh grade. Skill 5 shows the greatest gain of any of these skills in this school. The percentage growth from year to year will make clear the change of position in rank. Skill 11 places high in each of the classes, but the highest percentage of mastery is only 52.82. That means that the skill which showed the greatest degree of mastery by the pupils in this school is still not developed by much more than half of the pupils even in the eighth grade.

Tables VI through IX show the analysis for school "E".
Following is the order of the mastery of skills for each grade.
Grade 6.

1. Ability to read facts directly from a single pattern map.
- 2.5 Ability to apply physical facts to a map situation.
- 2.5 Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
4. Ability to interpret symbols by the use of a key.
5. Ability to read direction.
6. Ability to read facts directly from two pattern maps.
7. Ability to use a scale of miles.
8. Ability to recognize the general pattern of a time zone.
9. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
10. Ability to recognize symbols.
11. Ability to give latitude and longitude of a certain place.
12. Ability to find direction by the use of a parallel.
13. Ability to read direction of land slope from the direction of river flow.

Grade 7.

1. Ability to read facts directly from a single pattern map.
2. Ability to interpret symbols by the use of a key.
3. Ability to apply physical facts to a map situation.
4. Ability to read facts directly from two pattern maps.
5. Ability to read direction.
6. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.

TABLE VI
TEST 1 READING MAPS GRADE 6 "E" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	5	14	33.33
	2	9		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	2	9.52
3. ABILITY TO RECOGNIZE SYMBOLS.	6	6	24	22.86
	6	5		
	18	2		
	17	5		
4. ABILITY TO USE A SCALE OF MILES.	11	1	11	26.19
	12	10		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	3	24	38.10
	19	14		
	20	7		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	3	3	14.29
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	2	5	11.90
	9	3		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	9	10	23.31
	10	1		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP.	4	9	9	42.86
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	5	27	42.86
	19	14		
	20	7		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	16	30	56.19
	23	12		
	26	12		
	30	10		
	33	9		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	5	23	27.38
	29	5		
	31	10		
	35	3		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	2	39	23.21
	25	4		
	26	0		
	27	9		
	32	5		
	34	5		
	36	1		
	37	7		

7. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in a region.
8. Ability to recognize symbols.
9. Ability to use a scale of miles.
10. Ability to find direction by the use of a parallel.
11. Ability to give latitude and longitude of a certain place.
12. Ability to recognize the general pattern of a time zone.
13. Ability to read direction of land slope from the direction of river flow.

Grade 8.

1. Ability to use a scale of miles.
2. Ability to read facts directly from a single pattern map.
3. Ability to interpret symbols by the use of a key.
4. Ability to apply physical facts to a map situation.
5. Ability to read facts directly from two pattern maps.
6. Ability to read direction.
7. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
- 8.5 Ability to recognize symbols.
- 8.5 Ability to recognize the general pattern of a time zone.
10. Ability to obtain facts from several pattern maps and use them to estimate how man probably lives in the region.
11. Ability to give latitude and longitude of a certain place.
12. Ability to find direction by the use of a parallel.
13. Ability to read direction of land slope from the direction of river flow.

TABLE VII

TEST 1 READING MAPS GRADE 7 "E" SCHOOL

SPECIFIC SKILL	ITE	NUMBER OF CORRECT RESPONSES	CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1 2	5 19	24 41.38
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	10.90
3. ABILITY TO RECOGNIZE SYMBOLS.	6 9 10 17 18	12 4 4 12 15	47 33.57
4. ABILITY TO USE A SCALE OF MILES.	11 12	3 10	13 22.41
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15 19 20	14 22 10	46 32.17
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	4 4	4 13.79
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7 9	5 6	11 16.97
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3 10	6 1	7 10.17
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	11 11	11 37.93
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5 19 20	9 22 10	41 47.13
11. ABILITY TO READ FACTS DIRECTLY FROM A SIMPLE PATTERN MAP.	21 23 26 30 33	23 15 17 12 11	64 50.30
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	26 29 31 35	10 14 16 4	30 43.69
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING MAN'S PROBABLY LIMITS IN THE REGION.	24 25 26 27 32 34 35 37	5 25 12 10 12 10 3 10	60 77.97

TABLE VIII

TEST 1	READING MAPS	GRADE 1	"E" SCHOOL	
SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	4	23	46
	2	10		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	1	1	4
3. ABILITY TO RECOGNIZE SYMBOLS.	6	15	41	36
	8	5		
	16	4		
	17	8		
	18	13		
4. ABILITY TO USE A SCALE OF MILES.	11	1	10	67.50
	12	17		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	10	43	57.33
	19	21		
	20	4		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	5	5	20
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	3	4	8
	9	1		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	17	10	36
	10	1		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD SUN PATTERN.	4	10	10	40
	5	17	42	50
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	19	21		
	20	4		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	24	74	59.20
	23	15		
	26	14		
	30	11		
	33	10		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	15	50	50
	29	11		
	31	20		
	35	4		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	0	65	32.50
	25	12		
	26	7		
	27	15		
	32	11		
	34	0		
	36	2		
	37	0		

From table IX it will be noted that there seems to be a slight consistency in the order of the mastery of the skills. In one or two instances an ability has ranked a lower place in the seventh or eighth grade than it did in the sixth grade yet it has shown a percentage gain each year. Skill 10 is such an example. That is not true however for skills 2, 5, 7, 8, and 13.

TABLE IX

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "E"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8	Skill 9	Skill 10	Skill 11	Skill 12	Skill 13
Grade 6	5	13	10	7	4	11	12	8	2.5	2.5	1	6	9
Grade 7	5	13	8	9	2	11	10	12	6	3	1	4	7
Grade 8	6	13	8.5	1	3	11	12	8.5	7	4	2	5	10

A difference in enrollment may account for the loss in percentage of mastery on skill 2 between grades six and seven, for the same number of pupils made the correct response; but this could not be true for the other skills. For example, skill 13 had a correct response of 86 and a percentage of 37.07 in sixth grade, a correct response of 65 and a percentage of 32.50 in grade seven, and a correct response of 39 and a percentage of 23.61 in grade eight. What accounts for that loss of mastery?

The analysis for school "M" is given in tables X through XIII. This school is the most centrally located in the town and has a better representation of children from all types of homes than any other school. It is also the school which the transported children attend. Because of these facts this school probably presents the best cross section of the school population. The order of mastery for this school is as follows:

Grade 6.

1. Ability to read facts directly from a single pattern map.
2. Ability to interpret symbols by the use of a key.
3. Ability to apply physical facts to a map situation.
4. Ability to use a scale of miles.
5. Ability to recognize symbols.
6. Ability to read direction.
- 7.5 Ability to recognize the general pattern of a time zone.
- 7.5 Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
9. Ability to read facts directly from two pattern maps.
10. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
11. Ability to give latitude and longitude of a certain place.
12. Ability to find direction by the use of a parallel.
13. Ability to read direction of land slope from the direction of river flow.

Grade 7.

1. Ability to read facts directly from a single pattern map.

TABLE X
TEST 1 READING MAPS GRADE 5 "L" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	4	10	25.20
	2	5		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	0		0
3. ABILITY TO RECOGNIZE SYMBOLS.	6	8	36	31.30
	8	7		
	16	4		
	17	6		
	18	11		
4. ABILITY TO USE A SCALE OF MILES.	11	2	16	34.70
	12	14		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	11	29	42.03
	19	10		
	20	8		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	1	1	4.35
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	1	1	2.17
	9	0		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	7	10	21.74
	10	3		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP.	4	5	5	21.74
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	10	28	40.50
	19	10		
	20	5		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	23	55	47.63
	23	10		
	28	11		
	30	2		
	33	3		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	8	18	19.57
	29	3		
	31	7		
	35	0		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	3	24	13.74
	25	5		
	26	5		
	27	5		
	32	3		
	34	0		
	36	0		
	37	2		

2. Ability to interpret symbols by the use of a key.
3. Ability to read direction.
4. Ability to apply physical facts to a map situation.
5. Ability to read facts directly from two pattern maps.
6. Ability to recognize symbols.
7. Ability to recognize the general pattern of a time zone.
8. Ability to use a scale of miles.
9. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
10. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
11. Ability to find direction by the use of a parallel.
12. Ability to give latitude and longitude of a certain place.
13. Ability to read direction of land slope from the direction of river flow.

Grade 8.

1. Ability to read facts directly from a single pattern map.
2. Ability to interpret symbols by the use of a key.
3. Ability to read facts directly from two pattern maps.
4. Ability to apply physical facts to a map situation.
5. Ability to read direction.
6. Ability to recognize symbols.
7. Ability to recognize the general pattern of a time zone.
8. Ability to use a scale of miles.
9. Ability to find direction by the use of a parallel.
10. Ability to obtain facts from several pattern maps and use

TABLE XI

TEST 1 READING MAPS GRADE 7 " " SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	14	36	44.05
	2	22		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	2	5.41
3. ABILITY TO RECOGNIZE SYMBOLS.	6	17	63	34.05
	8	7		
	16	7		
	17	11		
	18	21		
4. ABILITY TO USE A SCALE OF MILES.	11	1	22	29.73
	12	21		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	24	57	51.35
	19	28		
	20	5		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	4	4	10.51
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	4	10	13.01
	9	6		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	23	24	32.43
	10	1		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP.	4	7	7	10.92
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	14	47	42.24
	19	20		
	20	5		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	32	67	51.50
	23	23		
	28	10		
	30	16		
	33	15		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	14	57	38.71
	29	6		
	31	32		
	35	3		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	0	79	25.49
	25	12		
	26	17		
	27	20		
	32	9		
	34	10		
	36	3		
	37	8		

TABLE XII

TEST 1 READING MAPS FORM 5 "I" 50-001

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES	CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	9	26
	2	17	
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	2	2
	14	2	
3. ABILITY TO RECOGNIZE SYMBOLS.	6	12	34
	8	7	
	16	7	
	17	11	
	18	17	
4. ABILITY TO USE A SCALE OF MILES.	11	2	15
	12	14	
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	20	46
	19	21	
	20	5	
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	6	24
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	7	14
	9	7	
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	8	13	17
	10	4	
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	6	24
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	14	40
	19	21	
	20	5	
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	25	97
	23	16	
	24	16	
	30	14	
	33	14	
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	14	56
	29	10	
	31	24	
	35	12	
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	0	50
	25	10	
	26	10	
	27	15	
	32	7	
	34	7	
	36	0	
	37	10	

them in estimating how man probably lives in the region.

11. Ability to give latitude and longitude of a certain place.
12. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
13. Ability to read direction of land slope from the direction of river flow.

The interesting fact to note in the analysis for this school is that seven of the skills have the same place in order in the eighth grade as they had in the seventh grade and that three of

TABLE XIII

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF THE SKILLS FROM BEST TO LEAST-----SCHOOL "M"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8	Skill 9	Skill 10	Skill 11	Skill 12	Skill 13
Grade 6	6	13	5	4	2	11	12	7.5	7.5	3	1	9	10
Grade 7	3	13	6	8	2	12	11	7	10	4	1	5	9
Grade 8	5	13	6	8	2	11	9	7	12	4	1	3	10

the skills have the same place in the three grades. Skills 4 and 9 show a loss between the sixth and seventh grades. No skill shows a loss between the seventh and eighth grades. All percentages of mastery are higher in the eighth than in the sixth grade except on skill 4 - ability to use a scale of miles. It would

appear that this skill is neglected in the upper grades. Although there is a remarkable gain in percentage of mastery in the eighth grade, the highest percentage of mastery on any skill is only 69.60, which means that even in the skill which rates highest only about two-thirds of the class are able to use it efficiently. Is that satisfactory?

Tables XIV through XVII give the analysis for school "C". This school is located in the most congested part of the town. It includes a large number of children from homes in which a foreign language is spoken as well as children from homes in the lowest socio-economic group. The order for the mastery of skills for this school follows:

Grade 6.

- 1.5 Ability to read facts directly from a single pattern map.
- 1.5 Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
3. Ability to apply physical facts to a map situation.
4. Ability to read direction.
5. Ability to interpret symbols by the use of a key.
6. Ability to recognize the general pattern of a time zone.
7. Ability to read facts directly from two pattern maps.
8. Ability to recognize symbols.
9. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
10. Ability to use a scale of miles.
11. Ability to find direction by the use of a parallel.

TABLE XIV

TEST 1 READING MAPS GRADE 6 "C" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	6		
	2	17	23	31.12
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	0	0	0
3. ABILITY TO RECOGNIZE SYMBOLS.	6	7		
	8	2		
	16	9	40	22.22
	17	8		
	18	14		
4. ABILITY TO USE A SCALE OF MILES.	11	6		
	12	8	14	19.44
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	6		
	19	17	34	31.48
	20	11		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	1	1	2.78
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	2		
	9	3	5	8.94
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	17		
	10	4	21	29.17
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP PATTERN.	4	14	14	36.59
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	11		
	19	17	39	38.11
	20	11		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	23		
	23	16		
	26	11	70	38.59
	30	16		
	33	2		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	5		
	29	12		
	31	16	40	27.78
	35	7		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	2		
	25	11		
	26	8		
	27	12	59	20.47
	30	12		
	34	3		
	36	1		
	37	4		

12. Ability to give latitude and longitude of a certain place.
13. Ability to read direction of land slope from the direction of river flow.

Grade 7.

1. Ability to read facts directly from a single pattern map.
2. Ability to interpret symbols by the use of a key.
3. Ability to apply physical facts to a map situation.
4. Ability to read direction.
5. Ability to recognize the general pattern of a time zone.
6. Ability to read facts from two pattern maps.
7. Ability to estimate man's way of living in a region from the location of the region in the world sun pattern.
8. Ability to recognize symbols.
9. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
10. Ability to use a scale of miles.
11. Ability to find direction by the use of a parallel.
12. Ability to give latitude and longitude of a certain place.
13. Ability to read direction of land slope from the direction of river flow.

Grade 8.

1. Ability to interpret symbols by the use of a key.
2. Ability to apply physical facts to a map situation.
3. Ability to read facts directly from a single pattern map.
4. Ability to read facts directly from two pattern maps.
5. Ability to read direction.

TABLE XV

TEST 1 READING MAPS GRADE 7 "C" SCHOOL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	0	25	41.07
	2	15		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	0	0	0
3. ABILITY TO RECOGNIZE SYMBOLS.	6	12	37	26.43
	8	7		
	10	1		
	17	8		
	18	9		
4. ABILITY TO USE A SCALE OF MILES.	11	3	11	19.64
	12	8		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	12	40	47.62
	19	21		
	20	7		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	1	1	1.57
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	1	5	8.93
	9	4		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	3	19	21	37.5
	10	2		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD MAP.	4	9	9	23.57
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	12	40	47.62
	19	21		
	20	7		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	26	62	50.57
	23	15		
	26	14		
	30	13		
	33	11		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	9	41	38.51
	29	8		
	31	19		
	35	5		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	1	38	25.89
	25	8		
	26	14		
	27	11		
	32	6		
	34	7		
	36	2		
	37	9		

TABLE VII
TEST 1 READING MAPS GRADE 6 "C" CONTROL

SPECIFIC SKILL	ITEM	NUMBER OF CORRECT RESPONSES		% CORRECT RESPONSES
1. ABILITY TO READ DIRECTION.	1	4	14	33.33
	2	10		
2. ABILITY TO READ DIRECTION OF LAND SLOPE FROM DIRECTION OF RIVER FLOW.	13	0	0	0
3. ABILITY TO RECOGNIZE SYMBOLS.	6	4	31	29.52
	8	3		
	16	5		
	17	9		
	18	10		
4. ABILITY TO USE A SCALE OF MILES.	11	0	7	16.67
	12	7		
5. ABILITY TO INTERPRET SYMBOLS BY THE USE OF A KEY.	15	11	34	53.97
	19	14		
	20	9		
6. ABILITY TO GIVE LATITUDE AND LONGITUDE OF A CERTAIN PLACE.	14	1	1	4.76
7. ABILITY TO FIND DIRECTION BY THE USE OF A PARALLEL.	7	0	1	2.38
	9	1		
8. ABILITY TO RECOGNIZE THE GENERAL PATTERN OF A TIME ZONE.	9	13	14	33.33
	10	1		
9. ABILITY TO ESTIMATE MAN'S WAY OF LIVING IN A REGION FROM THE LOCATION OF REGION IN WORLD SUN PATTERN.	4	4	4	10.05
10. ABILITY TO APPLY PHYSICAL FACTS TO A MAP SITUATION.	5	7	30	47.62
	19	14		
	20	9		
11. ABILITY TO READ FACTS DIRECTLY FROM A SINGLE PATTERN MAP.	21	10	40	46.67
	23	11		
	28	6		
	30	4		
	33	6		
12. ABILITY TO READ FACTS DIRECTLY FROM TWO PATTERN MAPS.	22	7	34	40.48
	29	10		
	31	10		
	35	1		
13. ABILITY TO OBTAIN FACTS FROM SEVERAL PATTERN MAPS AND USE THEM IN ESTIMATING HOW MAN PROBABLY LIVES IN THE REGION.	24	2	43	25.60
	25	3		
	26	10		
	27	9		
	32	7		
	34	2		
	36	1		
	37	0		

6. Ability to recognize the general pattern of a time zone.
7. Ability to recognize symbols.
8. Ability to obtain facts from several pattern maps and use them in estimating how man probably lives in the region.
9. Ability to estimate how man lives in a region from the location of the region in the world sun pattern.
10. Ability to use a scale of miles.
11. Ability to give latitude and longitude of a certain place.
12. Ability to find direction by the use of a parallel.
13. Ability to read direction of land slope from the direction of river flow.

TABLE XVII

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "C"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8	Skill 9	Skill 10	Skill 11	Skill 12	Skill 13
Grade 6	4	13	8	10	5	12	11	6	1.5	3	1.5	7	9
Grade 7	4	13	8	10	2	12	11	5	7	3	1	6	9
Grade 8	5	13	7	10	1	11	12	6	9	2	3	4	8

The summary of the distribution of the skills shows that there is growth in all skills but one in the seventh grade.

Skill 9 - ability to estimate man's way of living in a region

from the location of the region in the world sun pattern - shows a loss of ten percent in grade seven. The results for grade eight are amazing. Skills 1, 4, 7, and 9 show a loss in percentage of mastery not only from the seventh grade score but also from the sixth grade score. Skills 8, 11, and 13 also show a loss in percentage of mastery from the seventh grade score. This means that in grade eight only four skills show any growth and, in no instance, is the growth more than seven percent.

In reviewing the results for all the schools, it is evident that something should be done to increase the ability of these children in map reading. One singular thing about these results is that in every class skill 2 - ability to read direction of land slope from direction of river flow - rated thirteenth place. In some schools not one pupil made a correct response on the item which tested that skill. Could it be that there has never been any connection made with the simple geographic fact that water runs down hill?

The following list of suggestions is offered as a means of calling to the attention of the classroom teacher the ways by which the abilities connected with the skill in map reading may be developed.

1. Give practice in reading direction from a map asking questions as "What direction is Chicago from Milwaukee? Have pupils locate by direction some well-known points or places in the current news. It is a very good procedure to call to the children's attention the value of fixing in one's mind a few key reference points rather than try-

ing to fix all.

2. Have pupils trace the courses of rivers from source to mouth to show the direction of river flow. Local maps should be employed. If none are available, construction of them is a good project.
3. Raise questions like "Find the delta of the Mississippi River" and "What islands are south of Florida?" to check understanding of map symbols.
4. Give practice in using a scale of miles.
5. Have frequent lessons on using a key to interpret symbols; for example, finding the mountainous regions of North America.
6. Give practice in finding places by the use of parallels and meridians.
7. Do experiments which demonstrate how latitude and longitude are determined.
8. Hold discussion lessons using maps to show that physical facts apply to map situations; for example, the fact that the presence of mountains changes the amount of rainfall in nearby sections.
9. Have sets of outline maps with questions attached to which a child may turn to work on a skill in which he needs additional practice.
10. Have a discussion map lesson as the beginning study of a new region to obtain as many facts as possible about the new region from a map.
11. Have studies comparing conditions in cities or regions located in the same parallels.
12. Give practice in reading and interpreting facts from pattern maps.
13. Discuss with the children the relationship between zones and the sun pattern.4/

Isolated practice can be given in each of the map reading skills, but there is no doubt that practice given in connection with a topic being studied is much more effective. If the development of understandings is to be the major objective of the social studies program, it is desirable to develop abilities necessary in finding the facts needed in making conclusions.

The Use of an Index. - Test 3

Ability to use an index is a necessary skill. Its necessity has come from a life need often far removed from school work. A woman, for example, may be interested in a flower garden and want to know how to control certain insect pests, or she may want to know how to propagate some plants that do not produce seeds. The most likely place in which to find this information is in an encyclopedia of flowers. The ability to use an index plays an important part in her search for the desired knowledge. The innumerable mail order catalogs which are in use to-day also necessitate this skill.

Fundamentally the use of an index is a reading skill. Since it is not a native ability and since it cannot be effectively acquired through incidental learning, a definite place in the school program should be provided for its development. In schools where the content subjects are presented by problems instead of by pages in the textbook, the ability to use an index can be taught and practice can be given as logical and practical situations arise.

The total skill designated as "the ability to use an index" is comprised of many skills. Some of the lesser skills are very simple as, for example, alphabetizing, while others are complicated as, for example, using a cross reference. The pamphlet "A Course of Study in the Use of an Index" by Maude McBroom is especially recommended for teachers who are interested in the development of this skill. In her pamphlet Miss McBroom says, "This ability is most complete when it is the result of the mastery of a hierarchy of skills. Because of this fact this course of study in the use of the index is built up skill by skill, grade by grade." She also points out that "teachers will get best results in the teaching of this skill if they first develop a need for it and then give instruction and practice on its use. That is, children should first be given problems or data to look for, and when they discover their inability to get the material quickly, the expediency of the index may be pointed out. It is a foolish waste of time to spend long periods in teaching this skill if children do not have a need for it."

In the same pamphlet Miss McBroom identifies all the skills to be taught in each grade. She also gives sample exercises on each. Her list is as follows:

Skills required in the ability to use an Index

- | | |
|--|-------------------|
| I. Learning the names of letters,
recognition of each | Grades I, II, III |
| II. Learning the location of
letters in the alphabet with
relation to each other | Grades I, II, III |
| III. Arranging words alphabetically | Grades III, IV |

- | | |
|--|-------------------|
| IV. Using the index in simpler situations | Grades III and on |
| A. Realizing its usefulness | Grade III and on |
| B. Locating the index | Grade III and on |
| C. Observing kinds of indexes | Grade IV and on |
| D. Finding page on which to locate information | Grade III and on |
| 1. Selecting the key word in a sentence | Grade III and on |
| 2. Finding a main topic in an index | Grade III and on |
| 3. Deciding which sub-topic to use | Grade IV and on |
| 4. Learning the punctuation in an index | Grade IV and on |
| 5. Noting how many different types of information an index gives | Grade IV and on |
| 6. Locating material on a topic | Grade III and on |
| a. Using the index | Grade III and on |
| b. Using a list of references | Grade IV and on |
| V. Learning more difficult uses of the index | Grade V and on |
| A. Using cross references | Grade V and on |
| B. Making a list of references | Grade V and on 5/ |

This list of skills was carefully checked with part 3 of test B of the Iowa Every-Pupil Test of Basic Work Skills, Form

L. The items of this test measured the following skills:

1. Ability to select the key word in the sentence.
2. Ability to find the main topic in an index.
3. Ability to decide which sub-topic to use.
4. Ability to know the meaning of the punctuation in an index.
5. Ability to use a cross reference.

5/ McBroom, Maude, A Course of Study in the Use of the Index, Univ. of Iowa Extension Bulletin, #288.

As no literature is available on the order of difficulty of these skills, they are listed as they occur in the McBroom pamphlet. On the succeeding pages the results of this analysis are given. Each school was treated as a separate unit, and the results are given on that basis.

Tables XVIII through XXI, show the analysis for school "W". The order of mastery of the skills from best to least in this school is as listed.

Grade 6.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in the sentence.
3. Ability to find the main topic in an index.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

Grade 7.

1. Ability to select the key word in a sentence.
2. Ability to decide which sub-topic to use.
3. Ability to find the main topic in the index.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

Grade 8.

1. Ability to decide which sub-topic to use.
2. Ability to find the main topic in the index.
3. Ability to select the key word in the sentence.

TABLE XVIII

Test 3 Use of an Index Grade 6 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	13	58	38.67
	11	27		
	13	8		
	17	1		
	21	9		
2. Finding the main topic in an index.	1	24	38	31.67
	9	1		
	18	9		
	19	4		
3. Deciding which sub- topic to use.	3	17	58	48.33
	4	14		
	6	20		
	20	7		
4. Knowing the meaning of the punctuation of an index.	2	6	11	9.17
	5	3		
	12	1		
	16	1		
5. Using a cross reference.	7	9	35	29.17
	8	14		
	15	10		
	22	2		

TABLE XIX

Test 3 Use of an Index Grade 7 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	23	105	58.33
	11	28		
	13	21		
	17	2		
	21	31		
2. Finding the main topic in an index.	1	26	61	42.36
	9	12		
	18	18		
	19	5		
3. Deciding which sub-topic to use.	3	22	78	54.17
	4	18		
	6	25		
	20	13		
4. Knowing the meaning of the punctuation of an index.	2	10	29	20.14
	5	0		
	12	0		
	16	19		
5. Using a cross reference.	7	17	56	38.87
	8	13		
	15	19		
	22	7		

TABLE XX

Test 3 Use of an Index Grade 8 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	24	103	52.82
	11	37		
	13	22		
	17	4		
	21	16		
2. Finding the main topic in an index.	1	35	82	56.76
	9	15		
	18	20		
	19	12		
3. Deciding which sub- topic to use.	3	27	101	64.74
	4	25		
	6	29		
	20	20		
4. Knowing the meaning of the punctuation of an index.	2	8	20	12.82
	5	4		
	12	2		
	16	6		
5. Using a cross reference.	7	25	66	42.31
	8	18		
	15	19		
	22	4		

4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

TABLE XXI

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "W"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5
Grade 6	2	3	1	5	4
Grade 7	1	3	2	5	4
Grade 8	3	2	1	5	4

By looking at the tables which give the percentages on each skill, it can readily be seen that skill 4 - knowing the meaning of the punctuation of an index - is the skill most greatly in need of attention. It shows great progress in the seventh grade but none at all in the eighth grade. Skill 1 - ability to select the key word in the sentence - in the eighth grade also shows a loss of mastery by a number of pupils.

The analysis for school "E" is shown on tables XXII, XXIII, XXIV, and XXV. The order of mastery of the skills from best to least in school "E" is as follows:

TABLE XXII

Test 3 Use of an Index Grade 6 "E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	14	52	49.52
	11	20		
	13	8		
	17	1		
	21	9		
2. Finding the main topic in an index.	1	15	35	41.67
	9	7		
	18	11		
	19	2		
3. Deciding which sub- topic to use.	3	14	47	55.95
	4	12		
	6	14		
	20	7		
4. Knowing the meaning of the punctuation of an index.	2	2	3	3.57
	5	0		
	12	1		
	16	0		
5. Using a cross reference.	7	10	27	32.14
	8	8		
	15	5		
	22	4		

TABLE XXIII

Test 3

Use of an Index

Grade 7

"E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	23	79	54.62
	11	28		
	13	12		
	17	2		
	21	14		
2. Finding the main topic in an index.	1	24	56	48.28
	9	11		
	18	15		
	19	6		
3. Deciding which sub- topic to use.	3	27	88	75.86
	4	22		
	6	25		
	20	14		
4. Knowing the meaning of the punctuation of an index.	2	4	14	12.07
	5	4		
	12	1		
	16	5		
5. Using a cross reference.	7	15	50	43.10
	8	7		
	15	16		
	22	12		

TABLE XXIV

Test 3 Use of an Index Grade 8 "E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	17	77	61.60
	11	25		
	13	16		
	17	4		
	21	15		
2. Finding the main topic in an index.	1	22	66	66.00
	9	15		
	18	17		
	19	12		
3. Deciding which sub- topic to use.	3	19	81	81.00
	4	20		
	6	22		
	20	20		
4. Knowing the meaning of the punctuation of an index.	2	12	23	23.00
	5	2		
	12	2		
	16	7		
5. Using a cross reference.	7	21	60	60.00
	8	7		
	15	24		
	22	8		

Grade 6.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in the sentence.
3. Ability to find the main topic in the index.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

Grade 7.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in the sentence.
3. Ability to find the main topic in the index.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

Grade 8.

1. Ability to decide which sub-topic to use.
2. Ability to find the main topic in the index.
3. Ability to select the key word in the sentence.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation of the index.

As can be seen by the summary table, there is hardly any change in the order of mastery of the skills in this school. In order to see the yearly growth it is necessary to consult tables XXII, XXIII, and XXIV to see the increase in the percentage of mastery from year to year. In not one case is there a loss

shown on any skill. In every instance there is a great gain in the percentage of mastery for each year.

TABLE XXV

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "E"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5
Grade 6	2	3	1	5	4
Grade 7	2	3	1	5	4
Grade 8	3	2	1	5	4

Tables XXVI, XXVII, XXVIII, and XXIX give the analysis for school "M". The order of mastery is given in the list below.

Grade 6.

1. Ability to decide which sub-topic to use.
2. Ability to use a cross reference.
3. Ability to find the main topic in the index.
4. Ability to select the key word in the sentence.
5. Ability to know the meaning of the punctuation in an index.

Grade 7.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in the sentence.

TABLE XXVI

Test 3 Use of an Index Grade 6 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	7	33	28.79
	11	16		
	13	6		
	17	0		
	21	4		
2. Finding the main topic in an index.	1	19	27	29.35
	9	2		
	18	6		
	19	0		
3. Deciding which sub- topic to use.	3	13	47	51.09
	4	10		
	6	19		
	20	5		
4. Knowing the meaning of the punctuation of an index.	2	3	6	6.52
	5	0		
	12	1		
	16	2		
5. Using a cross reference.	7	10	33	35.87
	8	14		
	15	6		
	22	3		

TABLE XXVII

Test 3 Use of an Index Grade 7 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	28	82	43.24
	11	34		
	13	14		
	17	0		
	21	6		
2. Finding the main topic in an index.	1	32	51	34.46
	9	7		
	18	7		
	19	5		
3. Deciding which sub- topics to use.	3	27	98	66.22
	4	31		
	6	32		
	20	8		
4. Knowing the meaning of the punctuation in an index.	2	10	14	9.46
	5	3		
	12	1		
	16	0		
5. Using a cross reference.	7	21	56	37.85
	8	17		
	15	14		
	22	4		

TABLE XXVIII

Test 3 Use of an Index Grade 8 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	20	86	68.80
	11	25		
	13	18		
	17	5		
	21	18		
2. Finding the main topic in an index.	1	24	56	56.00
	9	10		
	18	19		
	19	3		
3. Deciding which sub- topic to use.	3	22	78	78.00
	4	21		
	6	20		
	20	15		
4. Knowing the meaning of the punctuation in an index.	2	9	20	20.00
	5	5		
	12	3		
	16	3		
5. Using a cross reference.	7	19	58	58.00
	8	9		
	15	17		
	22	13		

3. Ability to use a cross reference.
4. Ability to find the main topic in the index.
5. Ability to know the meaning of the punctuation in an index.

Grade 8.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in a sentence.
3. Ability to use a cross reference.
4. Ability to find the main topic in an index.
5. Ability to know the meaning of the punctuation in an index.

TABLE XXIX

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "M"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5
Grade 6	4	3	1	5	4
Grade 7	2	4	1	5	3
Grade 8	2	4	1	5	3

It is surprising to find that in a sixth grade the pupils know more about using a cross reference than they do about finding the main topic in an index. The percentage in the mastery of this skill shows only a slight gain in grade seven. All the other skills do show a gain each year, but they do not

measure up to what might be considered a desirable standard.

Skill 3 - deciding which sub-topic to use - is the only skill which show mastery by more than seventy-five percent of the pupils in the grade.

The analysis for school "C" is given in tables XXX through XXXIII. The order of mastery for this school is as follows:

Grade 6.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in a sentence.
3. Ability to find the main topic in an index.
4. Ability to use a cross reference.
5. Ability to know the meaning of the punctuation in an index.

Grade 7.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in a sentence.
3. Ability to use a cross reference.
4. Ability to find the main topic in an index.
5. Ability to know the meaning of the punctuation of an index.

Grade 8.

1. Ability to decide which sub-topic to use.
2. Ability to select the key word in a sentence.
3. Ability to use a cross reference.
4. Ability to find the main topic in an index.

TABLE XXX

Test 3 Use of an Index Grade 6 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	10	67	37.22
	11	35		
	13	10		
	17	3		
	21	9		
2. Finding the main topic in an index.	1	22	44	30.56
	9	2		
	18	15		
	19	5		
3. Deciding which sub-topic to use.	3	20	70	48.11
	4	15		
	6	26		
	20	9		
4. Knowing the meaning of the punctuation in an index.	2	6	11	7.64
	5	3		
	12	1		
	16	1		
5. Using a cross reference.	7	10	38	26.39
	8	14		
	15	10		
	22	4		



TABLE XXXI

Test 3 Use of an Index Grade 7 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10	21	78	55.71
	11	26		
	13	12		
	17	0		
	21	19		
2. Finding the main topic in an index.	1	20	47	41.96
	9	7		
	18	14		
	19	6		
3. Deciding which sub- topic to use.	3	22	78	69.64
	4	20		
	6	18		
	20	18		
4. Knowing the meaning of the punctuation of an index.	2	9	11	9.82
	5	1		
	12	1		
	16	0		
5. Using a cross reference.	7	15	50	44.64
	8	11		
	15	18		
	22	6		

TABLE XXXII

Test 3 Use of an Index Grade 8 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Selecting the key word in a sentence.	10 11 13 17 21	19 20 12 1 17	69	65.71
2. Finding the main topic in an index.	1 9 18 19	19 4 9 5	37	40.48
3. Deciding which sub- topic to use.	3 4 6 20	20 17 17 15	69	82.14
4. Knowing the meaning of the punctuation of an index.	2 5 12 16	5 2 0 3	10	11.90
5. Using a cross reference.	7 8 15 22	15 8 13 7	43	51.19

5. Ability to know the meaning of the punctuation of an index.

It can readily be seen that for the most part the skills have been very constant in their order in this school. Skill 2 - finding the main topic in an index - is the only one which shows a loss in any year. Skill 4 - knowing the meaning of the punctuation of an index - shows very little improvement after what would be, presumably, two years of use of that skill. The percentage of progress is only from 7.64 in the sixth grade to 11.90 in the eighth grade. It shows just slightly more than 2% growth each year.

TABLE XXXIII

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "C"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5
Grade 6	2	3	1	5	4
Grade 7	2	4	1	5	3
Grade 8	2	4	1	5	3

The analysis of the test on the use of an index reveals that all schools need to give direct instruction in the development of this skill. A particular need is to acquaint the children with the punctuation used in standard indices. The

following suggestions of ways by which skill in the use of an index can be developed are offered for the teachers who are interested in trying to help their pupils to learn the quickest and easiest way of locating material. In each case the teacher should use actual indices. Drill should not stop after one or two exercises have been presented but should be applied to class situations.

1. Give each child a mimeographed list of questions and have him underline the key word in each sentence.
2. Have a list of questions on the board. Have the children tell the key word in the sentence or have them indicate it in some manner on the board.
3. After the key word has been decided, have the children look up the topic in various text and reference books. Have each one write down the pages on which the material is to be found.
4. Have the children use their books and find in the index a topic which has several sub-topics. Ask questions which will make the children respond with one of the sub-topics. (Geography books are especially good for this type of exercise.)
5. Use a question such as, "Where in China could we engage a sampan?". Make a list of all the topics under which they could look for the desired information. Look up some of the suggested topics.
6. Give the children a list of maps and have them write

the pages on which the maps are found. Exchange papers and have them look up on the maps as a check on the accuracy of their friends. This will help to acquaint them with the punctuation used. Do the same for charts and illustrations.

7. Use the topics under discussion in the classroom material for index study.
8. Do the suggested index studies contained in reading and literature books.

Classes in history, geography, and science afford many opportunities for practice in the use of the index. At every opportunity pupils should be required to use the index rather than be allowed to search aimlessly for material. To offer practice in isolated instances defeats the purpose for which a skill is taught. Since this ability is needed in using dictionaries and other reference books, it should no longer be left to incidental teaching. It is a valuable tool used by people in all walks of life, and it deserves much more attention than it has received.

Reading Charts, Graphs and Tables. Test 5

The modern textbook makes use of charts, graphs, and tables to give factual information as well as reference material. It is therefore necessary that the children develop an ability to use such data. Much of the skill in using charts, graphs, and tables is left to incidental learning with the result that time is lost in trying to comprehend graphic

information and many incorrect impressions are formed. Because of the lack of direct instruction in the proper ways of using these devices, a valuable source of information is lost to the child. Pupils in the middle and upper grades of the elementary school should be given opportunity to learn how facts can be represented on graphs and how these same facts can be shown by different kinds of graphs, charts, or tables.

The authors of the Iowa Every-Pupil Test of Basic Work-Skills designated several abilities which they considered necessary for efficient reading of charts, graphs, and tables.

1. Ability to read amounts from a graph.
2. Ability to compare two or more amounts from a graph.
3. Ability to determine trends as shown on a line graph.
4. Ability to realize that percentages do not give absolute amounts.
5. Ability to compare values given in different columns in order to solve a problem.
6. Ability to grasp the outstanding facts portrayed by a graph.
7. Ability to recognize one of a number of general interpretations of a graph is correct.
8. Ability to determine rank from an unordered list of numbers.^{6/}

The number of correct scores on each item which tested each skill was tabulated for each class and the percentage of mastery for the class was found. The skills were then listed for each class in the order of percentage of mastery from best to least. Tables XXXIV through XXXIX show the results of this detailed analysis.

^{6/} Manual For Interpretation, op.cit., p. 54

From tables XXXIV, XXXV, XXXVI, and XXXVII the skills in their order of mastery in grades six, seven, and eight of school "W" were found to be in this order:

Grade 6.

1. Ability to compare values given in different columns in order to solve a problem.
2. Ability to read amounts from a graph.
- 3.5 Ability to grasp the outstanding facts portrayed by a graph.
- 3.5 Ability to determine rank from an unordered list of numbers.
5. Ability to compare two or more amounts from a graph.
- 6.5 Ability to determine trends as shown on a line graph.
- 6.5 Ability to recognize that one of a number of general interpretations of a graph is correct.
8. Ability to realize that percentages do not show absolute amounts.

Grade 7.

1. Ability to read amounts from a graph.
- 2.5 Ability to grasp the outstanding facts portrayed by a graph.
- 2.5 Ability to determine rank from an unordered list of numbers.
4. Ability to compare two or more amounts from a graph.
5. Ability to compare values given in different columns in order to solve a problem.

TABLE XXXIV
Test 5 Reading Graphs and Tables Grade 6 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	24	97	40.42
	2	7		
	5	10		
	6	10		
	9	11		
	11	14		
	14	14		
	17	7		
2. Ability to compare two or more amounts from a graph.	4	9	39	26.00
	8	11		
	19	7		
	20	6		
	22	6		
3. Ability to determine trends as shown on a line graph.	3	4	12	20.00
	23	4		
4. Ability to realize that percentages do not give absolute amounts.	10	4	11	18.33
	13	7		
5. Ability to compare values given in different columns in order to solve a problem.	18	13	13	43.33
6. Ability to grasp the outstanding facts portrayed by a graph.	7	12	20	33.33
	12	8		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	8	12	20.00
	21	4		
8. Ability to determine rank from an un- ordered list of numbers.	15	11	20	33.33
	16	9		

TABLE XXXV

Test 5 Reading Graphs and Tables Grade 7 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs. .	1 2 5 6 9 11 14 17	34 15 20 20 15 16 24 12	156	54.17
2. Ability to compare two or more amounts from a graph.	4 8 19 20 22	16 18 6 13 9	62	34.44
3. Ability to determine trends as shown on a line graph.	3 23	6 3	9	12.50
4. Ability to realize that percentages do not give absolute amounts.	10 13	8 8	16	22.22
5. Ability to compare values given in different columns in order to solve a problem.	18	11	11	30.56
6. Ability to grasp the outstanding facts portrayed by a graph.	7 12	16 10	26	36.11
7. Ability to recognize which one of a number of general interpretations of a graph.	3 21	6 4	10	13.89
8. Ability to determine rank from an un-ordered list of numbers.	15 16	16 10	26	36.11

6. Ability to realize that percentages do not give absolute amounts.
7. Ability to recognize that one of a number of general interpretations of a graph is correct.
8. Ability to determine trends as shown on a line graph.

Grade 8.

1. Ability to read amounts from a graph.
2. Ability to grasp the outstanding facts portrayed by a graph.
3. Ability to determine rank from an unordered list of numbers.
4. Ability to compare two or more amounts from a graph.
5. Ability to compare values in different columns.
in order to solve a problem.
6. Ability to realize that percentages do not give absolute amounts.
7. Ability to determine trends as shown on a line graph.
8. Ability to recognize that one of a number of general interpretations of a graph is correct.

There is a perceptible difference in the order of the position of the skills between grades six and seven, but very little difference between the position in grades seven and eight. From the tables which show percentages of mastery skills 3, 5, and 7 show a loss in grade seven. Skill 3 - ability to determine trends as shown on a line graph - had a percentage of mastery of 20.00 in grade six, a percentage of mastery of only

TABLE XXXVI

Test 5 Reading Graphs and Tables Grade 8 "W" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	34	167	53.53
	2	9		
	5	26		
	6	26		
	9	17		
	11	21		
	14	23		
	17	11		
2. Ability to compare two or more amounts from a graph.	4	15	75	38.46
	8	21		
	19	9		
	20	14		
	22	16		
3. Ability to determine trends as shown on a line graph.	3	14	20	25.64
	23	6		
4. Ability to realize that percentages do not give absolute amounts.	10	5	23	29.49
	13	18		
5. Ability to compare values given in different columns in order to solve a problem.	18	13	13	33.33
6. Ability to grasp the outstanding facts portrayed by a graph.	7	25	41	52.56
	12	16		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	14	17	21.79
	21	3		
8. Ability to determine rank from an un- ordered list of numbers.	15	18	36	46.15
	16	18		

12.50 in grade seven, and a percentage of mastery of 25.64 in grade eight. In short, after two years of use of a skill, the progress in it was only a little over five per cent. Skill 7 - ability to recognize which one of a number of general interpretations of a graph is correct - has a lower percentage of mastery in grade eight than in either grade six or seven. Even the most highly developed of the skills on this test in this school was only 53.53%.

TABLE XXXVII

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "W"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8
Grade 6	2	5	6.5	8	1	3.5	6.5	3.5
Grade 7	1	4	8	6	5	2.5	7	2.5
Grade 8	1	4	7	6	5	2	8	3

The order of mastery for the skills in school "E" is given in tables XXXVIII through XLI. The order of mastery for each of the grades is as follows:

Grade 6.

1. Ability to grasp the outstanding facts portrayed by a graph.

TABLE XXXVIII

Test 5 Reading Graphs and Tables Grade 6 "E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	19	83	49.40
	2	10		
	5	6		
	6	13		
	9	9		
	11	11		
	14	10		
	17	5		
2. Ability to compare two or more amounts from a graph.	4	6	38	36.19
	8	9		
	19	5		
	20	8		
	22	10		
3. Ability to determine trends as shown on a line graph.	3	7	11	26.19
	23	4		
4. Ability to realize that percentages do not give absolute amounts.	10	0	3	7.14
	13	3		
5. Ability to compare values given in different columns in order to solve a problem.	18	6	6	28.57
6. Ability to grasp the outstanding facts portrayed by a graph.	7	16	24	57.14
	12	8		
7. Ability to recognize which one of a number of general interpretations of a graph.	3	7	11	26.19
	21	4		
8. Ability to determine rank from an un-ordered list of numbers.	15	6	12	28.57
	16	6		

TABLE XXXIX

Test 5 Reading Graphs and Tables Grade 7 "E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	27	139	59.91
	2	16		
	5	13		
	6	20		
	9	19		
	11	19		
	14	11		
	17	14		
2. Ability to compare two or more amounts from a graph.	4	14	69	47.59
	8	16		
	19	11		
	20	14		
	22	14		
3. Ability to determine trends as shown on a line graph.	3	11	16	27.59
	23	5		
4. Ability to realize that percentages do not give absolute amounts.	10	6	14	24.14
	13	8		
5. Ability to compare values given in different columns in order to solve a problem.	18	16	16	55.17
6. Ability to grasp the outstanding facts portrayed by a graph.	7	13	22	37.93
	12	9		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	11	15	25.86
	21	4		
8. Ability to determine rank from an unordered list of numbers.	15	14	23	39.66
	16	9		

2. Ability to read amounts from a graph.
3. Ability to compare two or more amounts from a graph.
- 4.5 Ability to compare values given in different columns of a graph in order to solve a problem.
- 4.5 Ability to determine rank from an unordered list of numbers.
- 6.5 Ability to recognize one of a number of general interpretations of a graph is correct.
- 6.5 Ability to determine trends as shown on a line graph.
8. Ability to realize that percentages do not give absolute amounts.

Grade 7.

1. Ability to read amounts from a graph.
2. Ability to compare amounts given in different columns in order to solve a problem.
3. Ability to compare two or more amounts from a graph.
4. Ability to determine rank from an unordered list of numbers.
5. Ability to grasp the outstanding facts portrayed by a graph.
6. Ability to determine trends as shown on a line graph.
7. Ability to recognize one of a number of general interpretations of a graph is correct.

TABLE XL
Test 5 Reading Graphs and Tables Grade 8 "E" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	22	148	74.00
	2	18		
	5	22		
	6	20		
	9	19		
	11	19		
	14	17		
	17	11		
2. Ability to compare two or more amounts from a graph.	4	6	70	56.00
	8	22		
	19	13		
	20	18		
	22	11		
3. Ability to determine trends as shown on a line graph.	23	6	17	34.00
	3	11		
4. Ability to realize that percentages do not give absolute amounts.	10	5	18	36.00
	13	13		
5. Ability to compare values given in different columns in order to solve a problem.	18	20	20	80.00
6. Ability to grasp the outstanding facts portrayed by a graph.	7	18	25	50.00
	12	7		
7. Ability to recognize which one of a number of general interpretations of a graph.	3	11	17	34.00
	21	6		
8. Ability to determine rank from an unordered list of numbers.	15	10	18	36.00
	16	8		

8. Ability to realize that percentages do not give absolute amounts.

Grade 8.

1. Ability to compare values given in different columns in order to solve a problem.
2. Ability to read amounts from a graph.
3. Ability to compare two or more amounts from a graph.
4. Ability to grasp the outstanding facts portrayed by a graph.
- 5.5 Ability to realize that percentages do not give absolute amounts.
- 5.5 Ability to determine rank from an unordered list of numbers.
- 7.5 Ability to determine trends as shown on a line graph.
- 7.5 Ability to recognize one of a number of general interpretations of a graph is correct.

In this school the increase in the percentage of mastery on skills 1 and 5 for each year is evident. On skill 1 - ability to read amounts from a graph - the percentage of mastery in the sixth grade was 49.40 and in the eighth grade the percentage of mastery was 74.00. This is a gain of 24.60 percent. In the seventh grade this skill placed first in the order of distribution of mastery. Skill 2 - ability to compare two or more amounts from a graph - placed third in each grade in the order of distribution of mastery. Skill 5 - ability to compare values given in different columns in order to solve a problem -

TABLE XLI

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "E"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8
Grade 6	2	3	6.5	8	4.5	1	6.5	4.5
Grade 7	1	3	6	8	2	5	7	4
Grade 8	2	3	7.5	5.5	1	4	7.5	5.5

shows an increase of over 51% between the sixth and eighth grades. Skills 6 and 7 show a loss in grade seven.

The analysis of this test for school "M" is shown by tables XLIII through XLV. The order of mastery for the three grades follows.

Grade 6.

1. Ability to grasp the outstanding facts portrayed by a graph.
2. Ability to read amounts from a graph.
3. Ability to determine rank from an unordered list of numbers.
4. Ability to compare two or more amounts from a graph.

TABLE XLII

Test 5 Reading Graphs and Tables Grade 6 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	20	59	32.07
	2	5		
	5	6		
	6	9		
	9	2		
	11	7		
	14	8		
	17	2		
2. Ability to compare two or more amounts from a graph.	4	12	27	23.48
	8	9		
	19	3		
	20	2		
	22	1		
3. Ability to determine trends as shown on a line graph.	3	6	7	15.22
	23	1		
4. Ability to realize that percentages do not give absolute amounts.	10	4	8	17.39
	13	4		
5. Ability to compare values given in different columns in order to solve a problem.	18	2	2	8.70
6. Ability to grasp the outstanding facts portrayed by a graph.	7	10	16	34.78
	12	6		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	6	7	15.22
	21	1		
8. Ability to determine rank from an unordered list of numbers.	15	6	11	23.91
	16	5		

5. Ability to realize that percentages do not give absolute amounts.
- 6.5 Ability to determine trends from a line graph.
- 6.5 Ability to recognize one of a number of general interpretations of a graph is correct.
8. Ability to compare values given in different columns in order to solve a problem.

Grade 7.

1. Ability to read amounts from a graph.
2. Ability to grasp the outstanding facts portrayed by a graph.
3. Ability to determine rank from an unordered list of numbers.
4. Ability to compare values given in different columns in order to solve a problem.
5. Ability to compare two or more amounts from a graph.
6. Ability to realize that percentages do not give absolute amounts.
7. Ability to recognize one of a number of general interpretations of a graph is correct.
8. Ability to determine trends as shown on a line graph.

Grade 8.

1. Ability to read amounts from a graph.
2. Ability to compare amounts from a graph.
3. Ability to determine rank from an unordered list of numbers.

TABLE XLIII

Test 5 Reading Graphs and Tables Grade 7 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	34	173	58.45
	2	18		
	5	27		
	6	22		
	9	27		
	11	19		
	14	21		
	17	5		
2. Ability to compare two or more amounts from a graph.	4	15	52	28.11
	8	24		
	19	3		
	20	5		
	22	5		
3. Ability to determine trends as shown on a line graph.	3	12	14	18.92
	23	2		
4. Ability to realize that percentages do not give absolute amounts.	10	6	17	22.97
	13	11		
5. Ability to compare values given in different columns in order to solve a problem.	18	11	11	29.73
6. Ability to grasp the outstanding facts portrayed by a graph.	7	23	38	51.35
	12	15		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	15	16	21.62
	21	1		
8. Ability to determine rank from an unordered list of numbers.	15	18	27	36.49
	16	9		

TABLE XLIV

Test 5 Reading Graphs and Tables Grade 8 "M" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	25	144	72.00
	2	13		
	5	19		
	6	18		
	9	20		
	11	19		
	14	17		
	17	13		
2. Ability to compare two or more amounts from a graph.	4	15	74	59.20
	8	21		
	19	11		
	20	14		
	22	13		
3. Ability to determine trends as shown on a line graph.	23	7	16	32.00
	3	9		
4. Ability to realize that percentages do not give absolute amounts.	10	1	15	30.00
	13	14		
5. Ability to compare values given in different columns in order to solve a problem.	18	9	9	36.00
6. Ability to grasp the outstanding facts portrayed by a graph.	7	12	21	42.00
	12	9		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	9	14	28.00
	21	5		
8. Ability to determine rank from an unordered list of numbers.	15	14	24	48.00
	16	10		

4. Ability to grasp the outstanding facts portrayed by a graph.
5. Ability to compare values given in different columns in order to solve a problem.
6. Ability to determine trends as shown on a line graph.
7. Ability to realize that percentages do not give absolute amounts.
8. Ability to recognize one of a number of general interpretations of a graph is correct.

TABLE XLV

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "M"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8
Grade 6	2	4	6.5	5	8	1	6.5	3
Grade 7	1	5	8	6	4	2	7	3
Grade 8	1	2	6	7	5	4	8	3

As shown by table XLV. skill 8 - ability to determine rank from an unordered list of numbers - placed third in the distribution of the position of the order of mastery in each of the grades in this school. It also shows a gain in the percent-

age of mastery each year. Although the gain in the percentage of mastery between the sixth and the seventh grades was only 5% the gain between grades seven and eight was 10%. That is a 15% gain in mastery between the sixth and the eighth grades. Skill 1 - ability to read amounts from a graph - shows a gain of 40% in mastery between grades six and eight. In grade six the percentage of mastery was 32.07 and in grade eight the percentage of mastery was 72.00. This skill does not change position in the order of mastery between grades seven and eight but it did change position between grades six and seven. Skill 6 - ability to grasp the outstanding facts portrayed by a graph - seems to be the weakest skill on this test for this school. It shows a gain in the percentage of mastery between grades six and seven and a loss between grades seven and eight.

The analysis for school "C" is shown by tables XLVI through XLIX. The order of mastery is as follows:

Grade 6.

1. Ability to realize that percentages do not give absolute amounts.
- 2.5 Ability to read amounts from a graph.
- 2.5 Ability to compare values given in different columns in order to solve a problem.
4. Ability to determine rank from an unordered list of numbers.
5. Ability to compare two or more amounts from a graph.
6. Ability to grasp the outstanding facts portrayed by

TABLE XLVI

Test 5 Reading Graphs and Tables Grade 6 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1 2 5 6 9 11 14 17	28 9 12 11 9 12 16 7	104	36.11
2. Ability to compare two or more amounts from a graph.	4 8 19 20 22	14 18 10 8 3	53	29.44
3. Ability to determine trends as shown on a line graph.	3 23	5 10	15	20.83
4. Ability to realize that percentages do not give absolute amounts.	10 13	16 13	29	40.28
5. Ability to compare values given in different columns in order to solve a problem.	18	13	13	36.11
6. Ability to grasp the outstanding facts portrayed by a graph.	7 12	12 8	20	27.78
7. Ability to recognize which one of a number of general interpretations of a graph.	3 21	5 3	8	11.11
8. Ability to determine rank from an unordered list of numbers.	15 16	10 14	24	33.33

a graph.

7. Ability to determine trends as shown on a line graph.
8. Ability to recognize one of a number of general interpretations of a graph is correct.

Grade 7.

1. Ability to read amounts from a graph.
2. Ability to grasp the outstanding facts portrayed by a graph.
3. Ability to compare two or more amounts from a graph.
4. Ability to compare values given in different columns in order to solve a problem.
- 5.5 Ability to recognize one of a number of general interpretations of a graph is correct.
- 5.5 Ability to determine rank from an unordered list of numbers.
7. Ability to realize that percentages do not give absolute amounts.
8. Ability to determine trends as shown on a line graph.

Grade 8.

1. Ability to read amounts from a graph.
2. Ability to compare values given in different columns in order to solve a problem.
3. Ability to compare two or more amounts on a graph.
4. Ability to grasp the outstanding facts portrayed by a graph.
5. Ability to recognize one of a number of general

TABLE XLVII

Test 5 Reading Graphs and Tables Grade 7 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1	27	124	55.36
	2	10		
	5	18		
	6	13		
	9	11		
	11	16		
	14	22		
	17	7		
2. Ability to compare two or more amounts from a graph.	4	10	69	49.29
	8	14		
	19	10		
	20	17		
	22	18		
3. Ability to determine trends as shown on a line graph.	3	5	10	17.86
	23	5		
4. Ability to realize that percentages do not give absolute amounts.	10	8	15	26.79
	13	7		
5. Ability to compare values given in different columns in order to solve a problem.	18	12	12	42.86
6. Ability to grasp the outstanding facts portrayed by a graph.	7	17	30	53.57
	12	13		
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3	10	19	33.93
	21	9		
8. Ability to determine rank from an unordered list of numbers.	15	10	19	33.93
	16	9		

TABLE XLVIII

Test 5 Reading Graphs and Tables Grade 8 "C" School

Specific Skill	Item	Number of Correct Responses		% Correct Responses
1. Ability to read amounts from graphs.	1 2 5 6 9 11 14 17	18 8 14 13 15 12 13 9	102	60.71
2. Ability to compare two or more amounts from a graph.	4 8 19 20 22	10 14 5 10 15	54	51.43
3. Ability to determine trends as shown on a line graph.	23 3	6 9	15	35.71
4. Ability to realize that percentages do not give absolute amounts.	10 13	4 11	15	35.71
5. Ability to compare values given in different columns in order to solve a problem.	18	11	11	52.38
6. Ability to grasp the outstanding facts portrayed by a graph.	7 12	11 7	18	42.86
7. Ability to recognize which one of a number of general interpre- tations of a graph.	3 21	9 8	17	40.48
8. Ability to determine rank from an unordered list of numbers.	15 16	5 11	16	38.10

interpretations of a graph is correct.

6. Ability to determine rank from an unordered list of numbers.

7.5 Ability to determine trends as shown on a line graph.

7.5 Ability to realize that percentages do not show absolute amounts.

TABLE XLIX

SUMMARY OF THE DISTRIBUTION OF THE POSITION OF THE MASTERY
OF SKILLS FROM BEST TO LEAST-----SCHOOL "C"

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8
Grade 6	2.5	5	7	1	2.5	6	8	4
Grade 7	1	3	8	7	4	2	5.5	5.5
Grade 8	1	3	7.5	7.5	2	4	5	6

In this school the progress made in the skills from year to year is inconsistent. A gain of about 20% was made on skills 1, 2, 6, and 7 between grades six and seven. Skill 3 is the only skill which shows any marked degree of improvement in grade eight.

In order to make efficient use of a graph, chart, or table one must know the parts and the use made of each. Even

though grammar school children may not be familiar with terms such as title, scale, axis, base line, key, and label, they should be able to recognize them and use them in actual graph-reading situations. The following suggestions may be of help to the teachers who wish to develop some of the skills connected with the reading of such devices.

1. The simplest types of exercises are those in reading data showing class progress on spelling charts, arithmetic progress charts, results of tests, etc. Such charts have data on two axes, one the children's names, and the other the scores.
2. Questions may be given by the teacher in connection with simple bar graphs in geography, in which each axis has but one kind of data on it. Perhaps the name of the state and the amount of the production of a commodity, such as petroleum. The question might read, "How much petroleum was produced by Texas in 1932?" The data would be indicated in the title. To increase the difficulty of the reading, another variable could be added to one axis, such as the year, for example. Production could be given not only by state, but by years.
3. Difficulties are added when the child must transpose data as, for example, when production is given in millions of bushels or thousands of tons, and so on.
4. In addition to the mere reading of data from the graph, questions may call for interpretation. For example, "How does the amount of production of coal in the United States compare with that of Germany?"
5. Children may be given a certain graph or table and permitted to state their own questions from it.

6. Pupils may be given data in a simple table and asked to put the material into a graph. For example, they might show their own progress on tests, or the ages of the group, or spelling scores over a period, and so on.
7. Pupils may be given a simple graph and told to make all the statements they can of facts which the graph or chart shows. The teacher must guard against the inclusion of statements which are not true.^{7/}

The reading of graphical representations is primarily a reading skill; but arithmetical, mechanical, and interpretive skills are also necessary. All these skills or abilities can be drilled upon in isolation, but they will be more clearly and understandingly developed if they are taught in connection with definite school situations.

^{7/} Manual For Interpretation of Iowa Every-Pupil Test of Basic Skills, Form L, page 54.

III

CONCLUSION

From the data obtained by this study the following conclusions are presented:

1. The pupils in the sixth, seventh, and eighth grades of the public schools of Town X do not show a high degree of mastery on the skills measured by this test.
2. In the majority of techniques tested the pupils do not show a year's growth in each grade.
3. There is reason to believe that in one school these skills are not taught until the eighth grade.
4. There is reason to believe that in some schools no direct instruction is given in these skills after the sixth grade.

These conclusions cannot be accepted as giving a complete and final picture of the situation. These conclusions are based solely on the evidence of the test scores, and no regard has been given to the factors that influence test scores. Many factors contribute to the results of any test, and those factors should be taken into consideration before any final judgment is made. Let us consider a few of the factors which may have affected the scores used in this study.

The first factor is the intelligence or learning capacity of the children together with their past educational history.

The best instruction possible cannot raise class scores to any marked degree if the average intelligence of the class is low or if the pupils have had poor instruction in earlier grades. Likewise, even the poorest of teaching procedures will not prevent pupils from making high scores if they are endowed with better than average intelligence. Is it not possible then that the classes which have the lowest scores may be doing better in comparison with their ability than some of the groups with high scores?

The second factor is the out-of-school environment. Is it not logical to expect higher scores from classes in the schools which have a large enrollment of children from homes in the better than average socio-economic classification and in which the only language spoken is English, than from classes in schools where the opposite circumstances prevail? Since the interpretation of the questions on this test was entirely dependent upon reading ability, any language handicap would lower the pupil's score and affect the class score.

The third factor is the administrative and supervisory practices. In this connection these questions must be answered. How adequately are the classes in the various schools supplied with instructional materials such as books, cards, and charts? Do all schools have libraries? Are the textbooks in use in each grade meeting the needs of the children? Are some schools equipped with reference materials while others are limited to the use of a single text? With what quality of supervisory

service are the schools provided?

The fourth factor is the course of study. Is there a uniform course of study throughout the town? What help has been given the teachers in respect to an analysis of the skills which are to be mastered at each grade level? Is there provided in the course of study an outline of the skills and suggestions for their development? What professional references have been made available to the teachers which would help them in teaching these basic skills? How does the material in the test used compare with the material in the course of study?^{8/}

After due consideration has been given to these many factors, it may be found that the results of the test in some schools are justified and therefore quite satisfactory for the pupils in that school. On the other hand some of the scores which seem relatively high may prove to be unsatisfactory for the pupils in that school.

The data gathered for this study has given rise to many other problems which the writer has not investigated. These problems now remain for future study:

1. A two year follow-up study of the progress of the pupils in the present sixth grade.
2. A comparison of the test results in the four sixth, seventh, and eighth grades on the basis of I.Q's.

^{8/} Manual For Interpretation, op.cit., p. 28-33

3. A comparison of the order of mastery of the skills as shown by the upper quarter of the pupils with the lower quarter of the pupils.
4. A survey of the reference materials in the various schools and a comparison of the test results in the school having the most reference facilities with those of the school having the fewest reference facilities.
5. A survey of the course of study to determine the provisions made for the teaching of the basic work-study skills.
6. The construction of a detailed outline of the skills to be taught in each grade with suggestions and exercises given for their development.

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